

# **High-Definition Multimedia Interface**

**Version 2.0**

**Quantum Data MOI v1.0**

**Test ID: HF1-11**

July 15, 2014

# Preface

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## Document Revision History

1.0 July 15, 2014 – Initial Release.

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## Contact Information

The URL for the HDMI Forum web site is: <http://www.hdmiforum.org/>

The URL for the Quantum Data website is: <http://www.quantumdata.com>.

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# Introduction

This document provides a set of Method of Implementation for test method described in HDMI Compliance Test Specification Version 2.0 (HDMI CTS 2.0). HDMI Forum created HDMI CTS 2.0 to specify a set of tests that should be performed to verify features described in HDMI Specification Version 2.0.

## Scope

This document provides testing procedures for HDMI CTS 2.0 Test ID HF1-11: “TMDS Protocol – 6G Legal Codes.” The procedure below deals with single resolution and only one Test ID is considered at a time.

## References

### Normative References

High-Definition Multimedia Interface Specification Version 1.4b, October 11, 2011.  
HDMI Compliance Test Specification Version 1.4b, October 11, 2011.  
High-Definition Multimedia Interface Specification Version 2.0, August, 2013.  
HDMI Compliance Test Specification Version 2.0.

### Informative Reference

No additional informative references.

## Test ID HF1-11: TMDS Protocol – 6G Legal Codes

### Objective

Confirm that the Source only outputs legal 10-bit codes.

Table 7-23 Source TMDS Protocol - 6G – 2160p Legal Codes Requirements

Reference	Requirement
[HDMI: 5.1.2] Operating Modes Overview	<See reference for details>
HDMI: 5.4.2] Control Period Coding	<See reference for details>
[HDMI: 5.4.3] TERC4 Coding	<See reference for details>
[HDMI: 5.4.4] Video Data Coding	<See reference for details>
[HDMI 2.0: 6.1.2] Scrambling for EMI/RFI Reduction	<See reference for details>

### Capability(s)

The Source DUT supports any 2160p Video Format/color mode for TMDS Character Rate above 340Mcsc up to 600Mcsc.

### Test Equipment

Item	Generic Equipment	Vendor Specific Equipment	Quantity
1	HDMI 2.0 Protocol Analyzer	980 Advanced Test Platform series: 980 HDMI 2.0 Protocol Analyzer module HDMI CTS 2.0 Compliance Test Package #3	1

### Generic Procedure

- 1 If the CDF field Source\_Above\_340 is “N”, then SKIP this test.

Setup:

- 2 Connect the Source DUT to the Protocol Analyzer.
- 3 Configure the EDID, which indicates all Video Formats necessary for this test.
- 4 Operate the Source DUT to output a 2160p Video Format supported by the DUT with the lowest TMDS Character Rate above 340Mcsc up to 600Mcsc.

Measure:

- 5 Operate the Source DUT to output a 2160p Video Format supported by the DUT with the lowest TMDS Character Rate above 340Mcsc up to 600Mcsc.
  - 5.1 Any legal Video Data codes.
    - 5.1.1 Any Video Data Code that was encoded with an approximate DC balance as well as a reduction in the number of transitions in the data stream.
  - 5.2 4 Control Period codes.
  - 5.3 16 TERC4 codes.
  - 5.4 32 Scrambled Control Period codes.
- 6 If any channel contains a 10-bit code that is not one of the above, then FAIL.
- 7 Verify that, for all Pixels, if all three TMDS channels are encoded in the same manner.
- 8 If any  $T_{\text{character}}$  does not use consistent encoding across all three channels, then FAIL.

Vendor Specific Test Procedure

Test Equipment

A variety of equipment is needed for testing HDMI products. Each piece is authorized and included by name in this Compliance Test Specification. This section describes the Quantum Data test equipment.

HDMI 2.0 Protocol Analyzer module

The Quantum Data 980 HDMI 2.0 Protocol Analyzer module can be installed in the 980B or 980R series Advanced Test Platforms. This 980 HDMI 2.0 Protocol Analyzer module serves the generic test functions called out in the HDMI 2.0 Generic CTS. Refer to the table below:

Item	Quantum Data Equipment	
1	980 Advanced Test Platform series:	
	Equipped with:	980 HDMI 2.0 Protocol Analyzer module
		HDMI CTS 2.0 Compliance Test Package #3

980 HDMI 2.0 Protocol Analyzer Module with 980 Series Platform Configurations

The figures below show depictions of the 980 HDMI 2.0 Protocol Analyzer module equipped in various 980 series platforms. **Note:** Card positioning may vary depending on configuration.



Source TMDS Protocol

Test ID HF1-11 - TMDS Protocol – 6G Legal Codes

### 1. Objective

Confirm that the Source only outputs legal 10-bit codes.

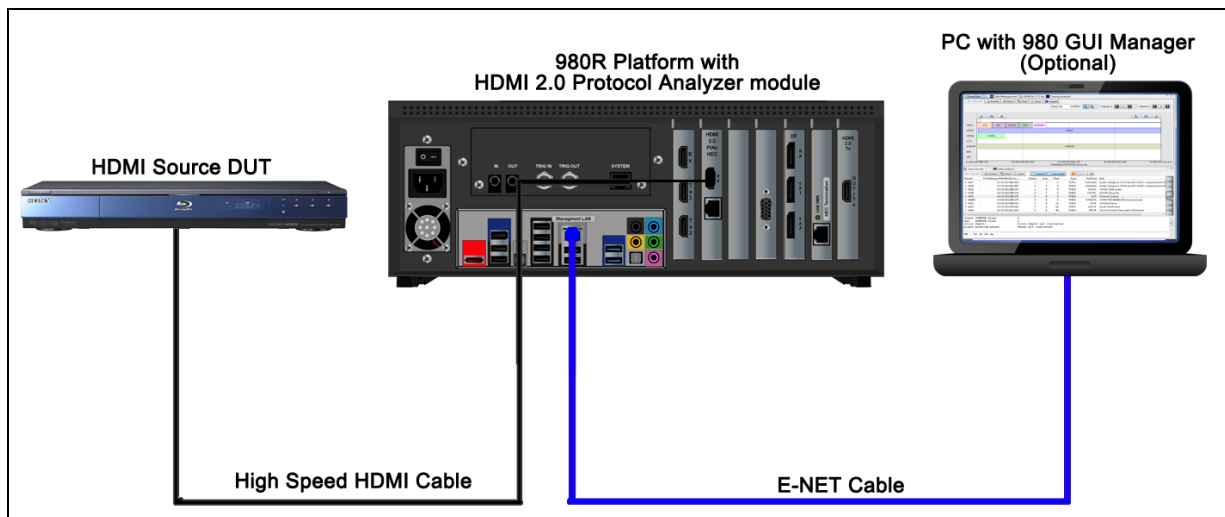
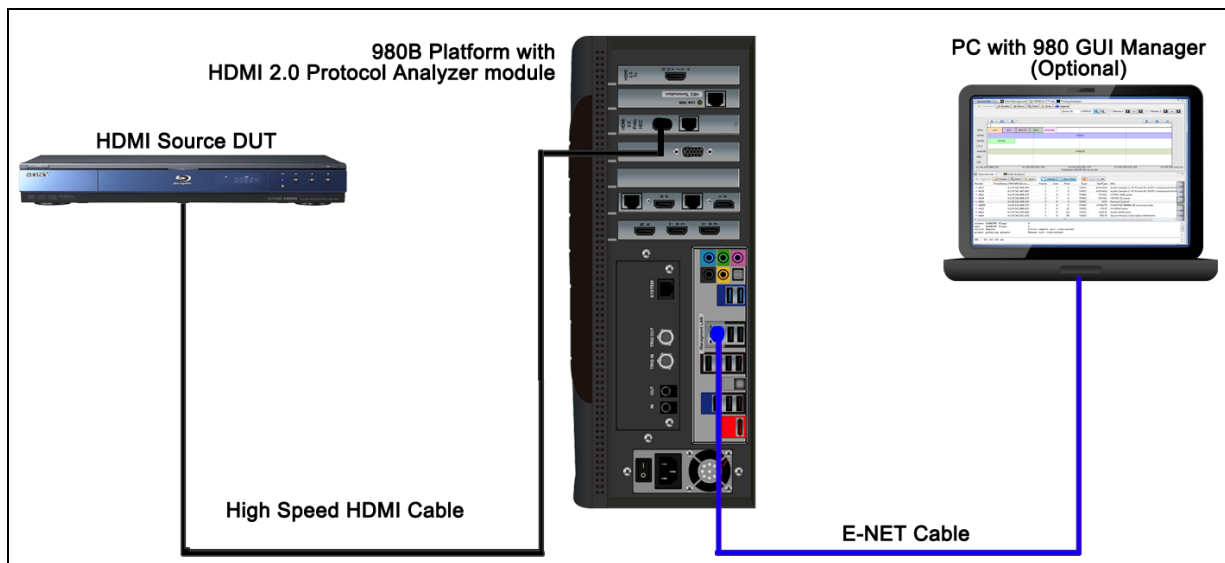
### 2. Test Overview

The Pass/Fail criteria is assessed by the application with no human examination required.

### 3. Procedure

Use the following procedure to conduct this test.

- 1 Connect Source DUT to the Quantum Data 980 HDMI 2.0 Protocol Analyzer at the module's port labeled Rx. Use a High Speed HDMI cable. The figures below show depictions of connections to the 980 HDMI 2.0 Protocol Analyzer module residing in various 980 series chassis.



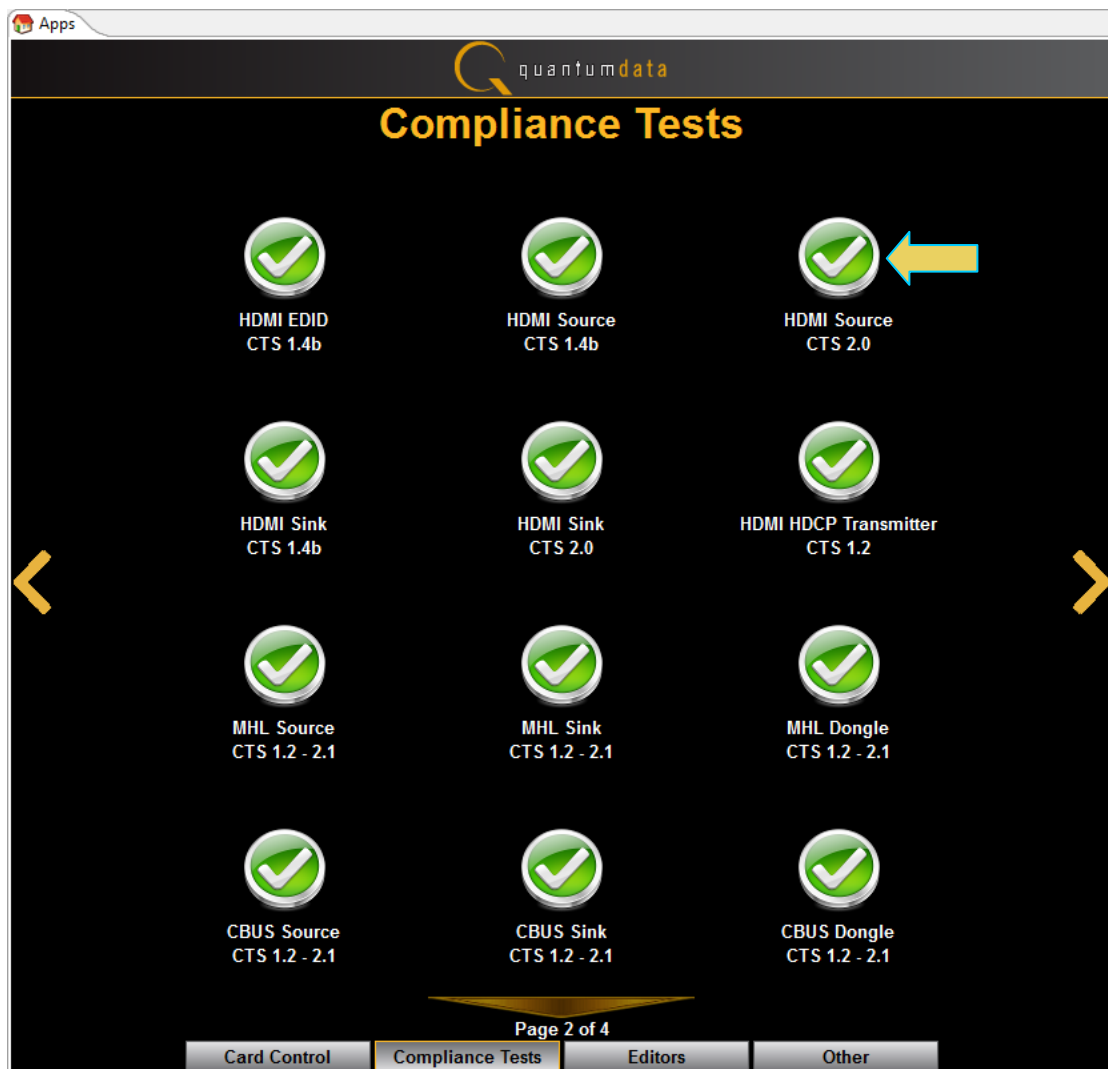


- 2 Operate the Source DUT to output a 2160p Video Format supported by the DUT with the lowest TMDS Character Rate above 340Mcsc up to 600Mcsc.
- 3 Use Quantum Data 980 Embedded Manager GUI (touchscreen) or invoke Quantum Data 980 External Manager GUI (Windows application).

**Note:** You will not need to connect the PC shown in the figures above if you are running the compliance test through the 980's embedded display. The PC running the 980 HDMI Protocol Analyzer module's compliance test application is connected to the 980 through a standard Ethernet cable.

- 4 Complete the following steps:

4.1 Click on the HDMI Source CTS 2.0 icon in the Compliance Tests page of the Apps panel.



- 4.2 Navigate to the CDF tab if not already there. If there is a saved CDF file, then click on Open and select it. Otherwise, enter the DUT's CDF information for each tab and optionally click on Save to save the CDF.

HDMI 2.0 Src CT 2.0

CDF Entry | Section | Test Options / Preview

Open | New | Save | CDF File: <not saved>

General | Y420 Video | 21:9 (64:27) Video | 6G Video

Source\_LTE\_340Mscs\_Scrambling

Does the product support scrambling for TMDS Character Rates at or below 340Mscs?

☒ Yes ☐ No

Source\_Above\_340

Does the product support any Video Format/color mode for TMDS Character Rate above 340Mscs up to 600Mscs?

☒ Yes ☐ No

**Source\_2160p\_Video\_Formats\_Above\_340**

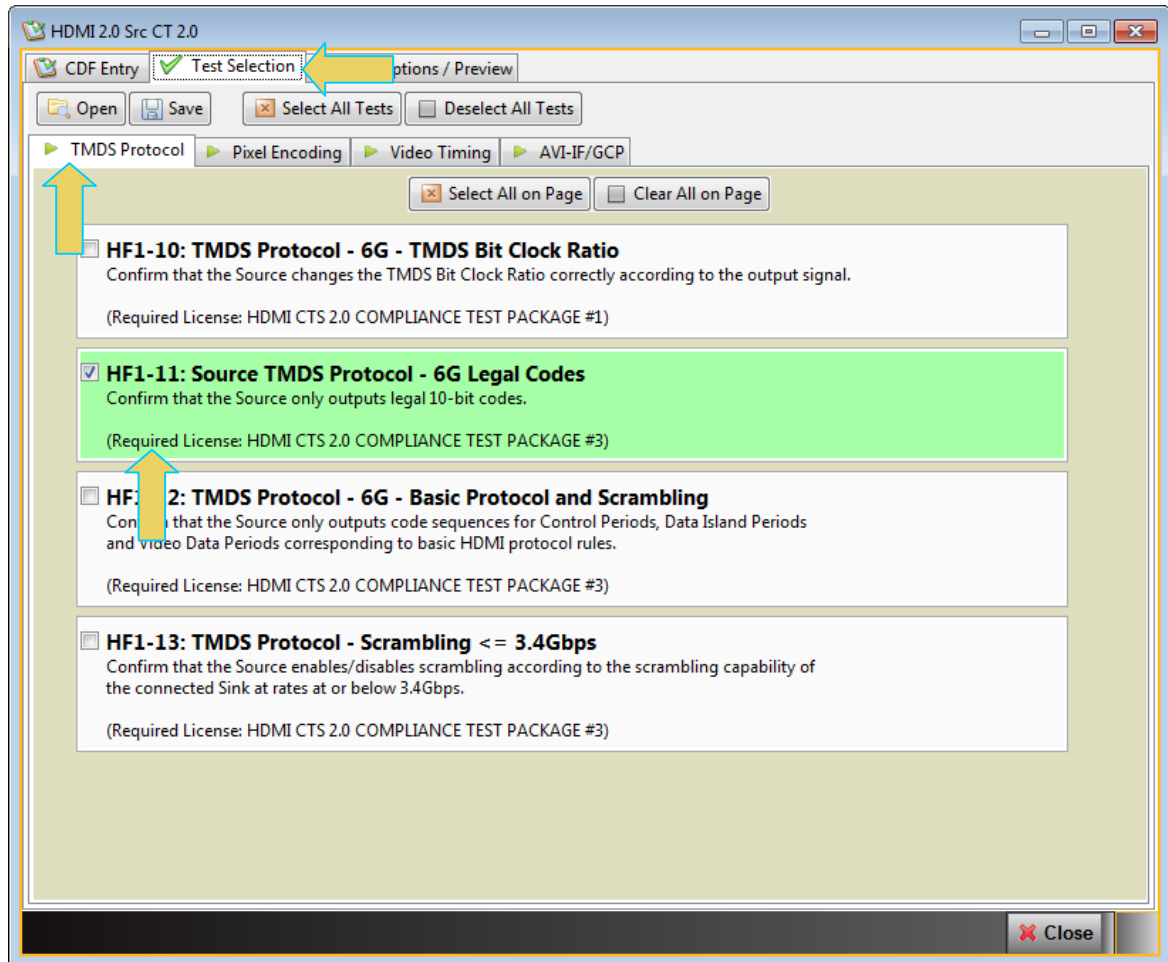
(96) 3840x2160p @ 50 Hz 16:9	<input checked="" type="radio"/> Yes <input type="radio"/> No
(97) 3840x2160p @ 60 Hz 16:9	<input checked="" type="radio"/> Yes <input type="radio"/> No
(101) 4096x2160p @ 50 Hz 256:135	<input checked="" type="radio"/> Yes <input type="radio"/> No
(102) 4096x2160p @ 60 Hz 256:135	<input checked="" type="radio"/> Yes <input type="radio"/> No
(106) 3840x2160p @ 50 Hz 64:27	<input checked="" type="radio"/> Yes <input type="radio"/> No
(107) 3840x2160p @ 60 Hz 64:27	<input checked="" type="radio"/> Yes <input type="radio"/> No

**Source\_2160p\_DC\_Video\_Formats\_Above\_340**

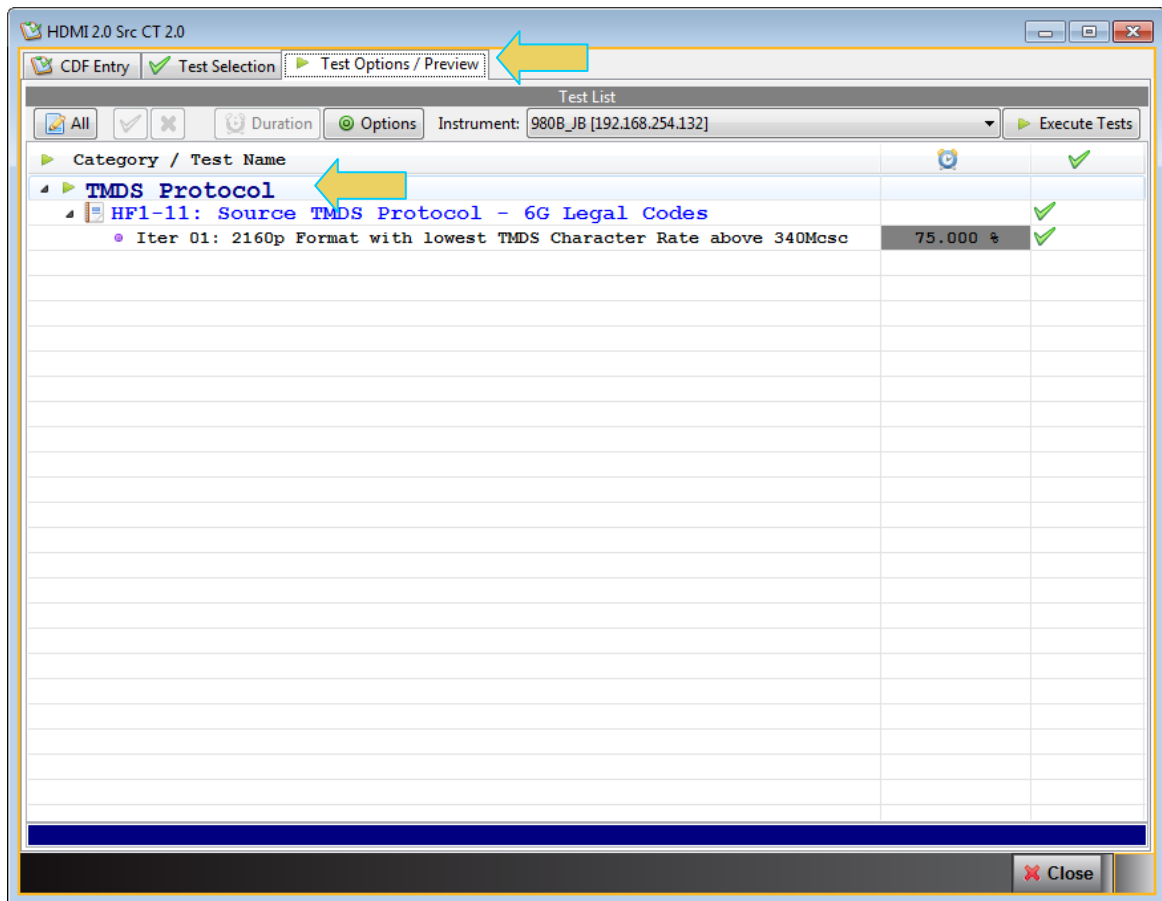
Format	30	36	48	(bits per pixel)
(93) 3840x2160p @ 24 Hz 16:9	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(94) 3840x2160p @ 25 Hz 16:9	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(95) 3840x2160p @ 30 Hz 16:9	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(98) 4096x2160p @ 24 Hz 256:135	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(99) 4096x2160p @ 25 Hz 256:135	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(100) 4096x2160p @ 30 Hz 256:135	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(103) 3840x2160p @ 24 Hz 64:27	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(104) 3840x2160p @ 25 Hz 64:27	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(105) 3840x2160p @ 30 Hz 64:27	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)

Close

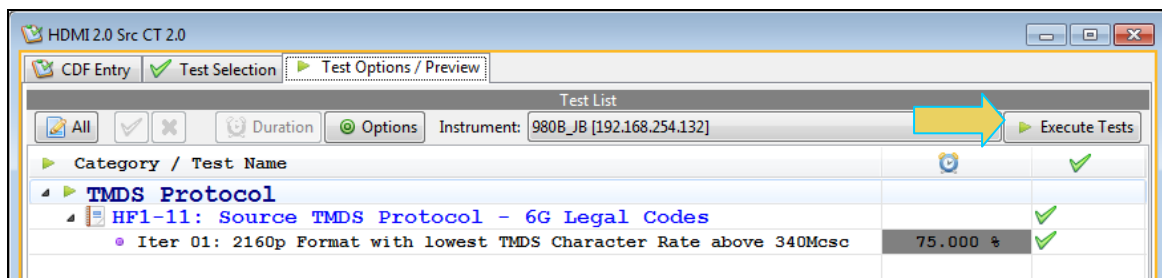
- 4.3 Click on the Test Selection tab and the TMDS Protocol sub tab and select the HF1-11 Source TMDS Protocol – 6G Legal Codes Test. Refer to the sample screen below.



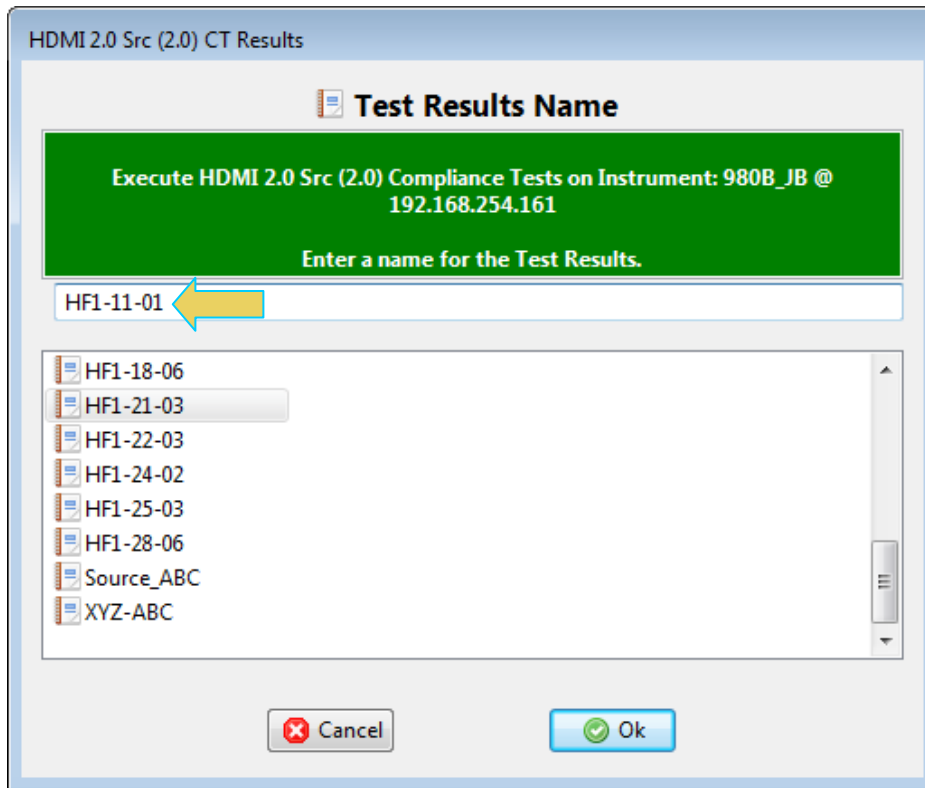
- 4.4 Click on Test Options / Preview tab and review the list of tests. Refer to the sample screen below.



4.5 Click on Execute tests activation button to initiate the test. Refer to the sample screen below.

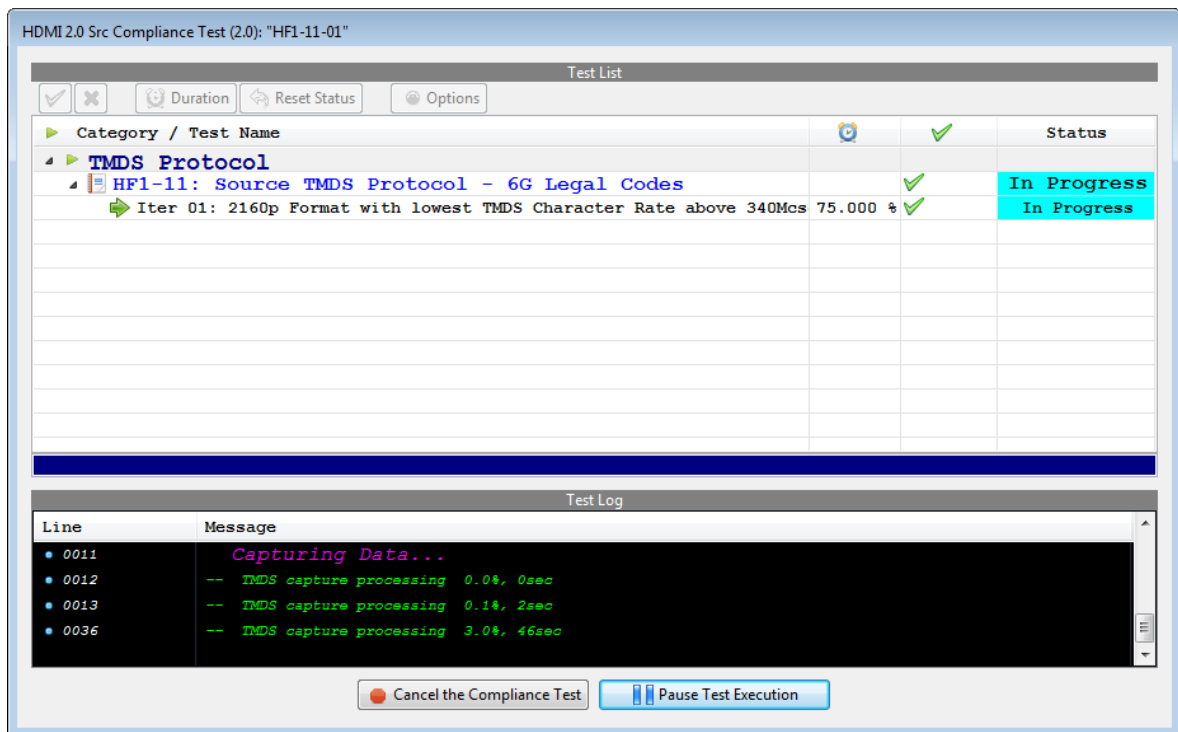


**Note:** You will be prompted with a dialog box to assign a name to the test results. Refer to the screen example below:

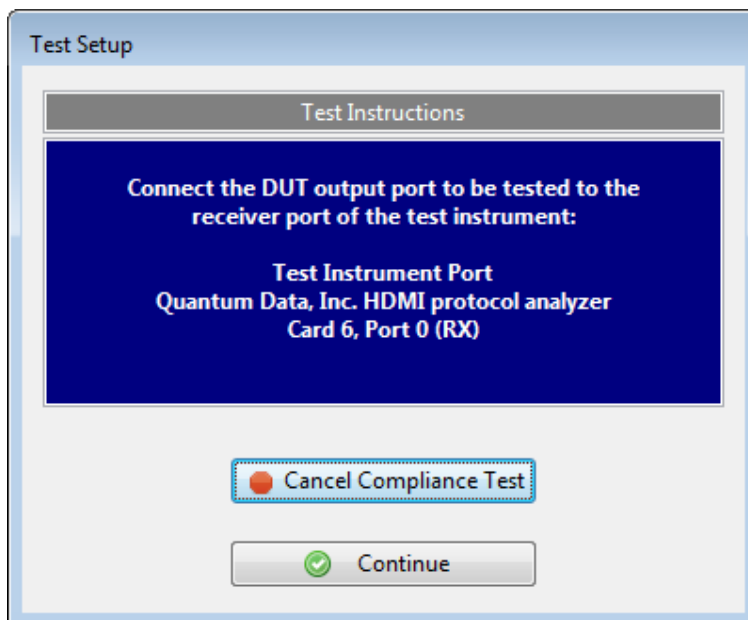


Enter a name, click OK and the test will begin.

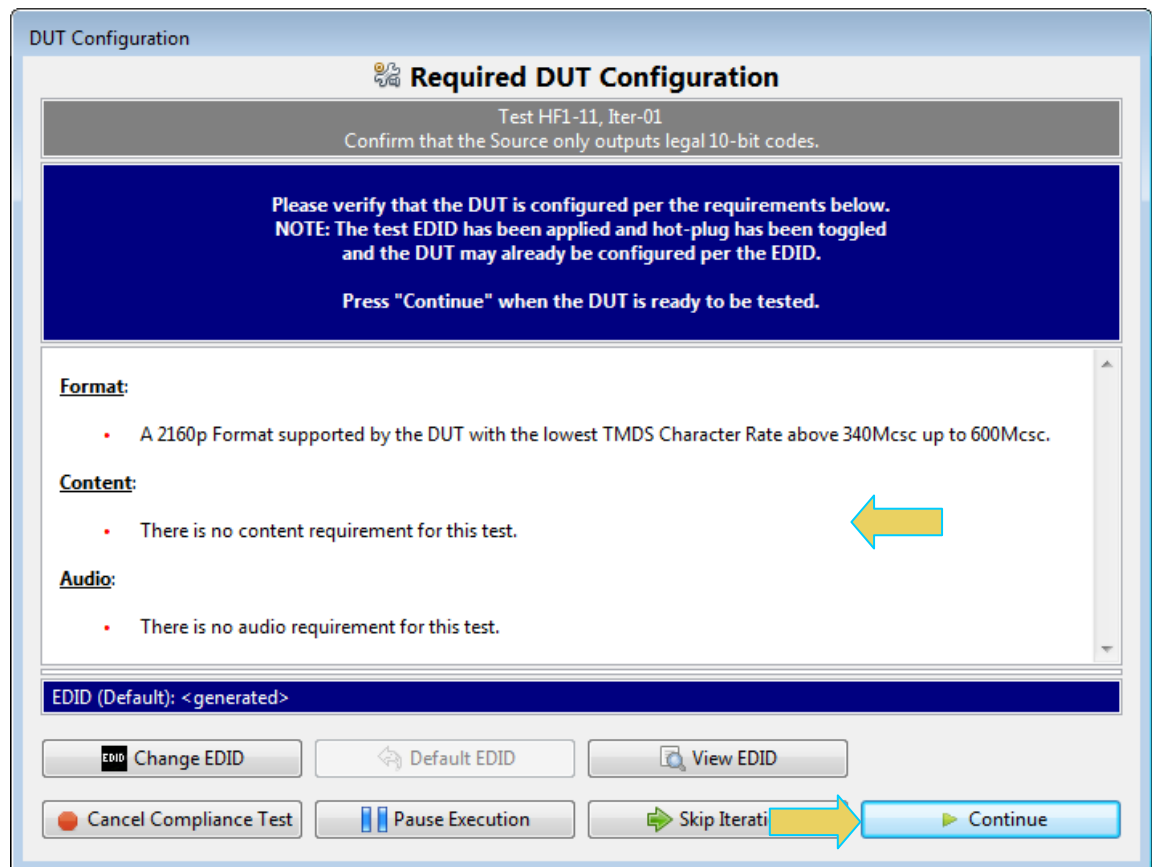
A Test Window will appear (below) indicating the progress of the test.



A dialog box will appear (below) indicating the test setup.



You will be prompted with a series of dialog boxes informing you of the requirements of the source DUT. Verify that the source is outputting the required HDMI format and pixel encoding and press Continue to run the test.



- 5 If the 980 HDMI Protocol Analyzer's compliance test application reports PASS, then PASS.  
If the 980 HDMI Protocol Analyzer's compliance test application reports FAIL, then FAIL.

